

(19) 日本国特許庁 (J P)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平8-134723

(43) 公開日 平成8年(1996)5月28日

(51) Int. Cl.⁴

D 0 1 F 8/14

識別記号

Z A B B

庁内整理番号

F I

技術表示箇所

Translation attached

審査請求 未請求 請求項の数3 O L (全 4 頁)

(21) 出願番号 特願平8-273343

(22) 出願日 平成6年(1994)11月8日

(71) 出願人 000004503

ユニチカ株式会社

兵庫県尼崎市東本町1丁目50番地

(71) 出願人 591178012

財団法人地球環境産業技術研究機構

京都府相楽郡木津町木津川台9丁目2番地

(72) 発明者 平野 まどか

京都府宇治市宇治小坂23番地 ユニチカ株式会社中央研究所内

(72) 発明者 角本 幸治

京都府宇治市宇治小坂23番地 ユニチカ株式会社中央研究所内

最終頁に続く

(54) 【発明の名称】 生分解性複合繊維

(57) 【要約】

【目的】 製糸性良く製造することができ、生分解性及び染色性の度合いの異なる繊維とすることが可能な生分解性複合繊維を提供する。

【構成】 生分解性を有し、結晶化速度の異なる成分A及び成分Bで構成された複合繊維であって、成分Aと成分Bが繊維断面において交互配列され、そのいずれもが繊維軸方向に連続するとともに繊維表面に露出している交互配列型の生分解性複合繊維。

【発明の効果】本発明によれば、製糸性良く製造することができ、生分解性及び染色性の度合いの異なる繊維と

することが可能な生分解性複合繊維が提供される。

フロントページの続き

(72)発明者 山田 健二

京都府宇治市宇治小桜23番地 ユニチカ株式会社中央研究所内

(72)発明者 村瀬 繁清

京都府宇治市宇治小桜23番地 ユニチカ株式会社中央研究所内

TRANSLATION OF JAPANESE PATENT KOKAI H8-134723

Japanese Patent Office (JP)

Patent Application Laid Open

JAPANESE PATENT KOKAI (A) H8-134723

Published 28th May 1996

International Classification ⁸	Recognition Code	Office Handling Number
--	---------------------	---------------------------

D 01 F 8/14	ZAB B	
-------------	-------	--

F1	Technical Display Location
----	----------------------------

Request for Examination: Not yet requested

Number of Claims: 3 OL

Number of Pages in the Japanese Text: 4

Application Number: H6-273343

Date of Application: 8th November 1994

Applicant: 000004503

Yunichika K.K.

50 Higashi Honcho-1-chome, Amagasaki-shi,
Hyogo-ken, Japan

Applicant: 591178012

Global Environment Industrial Technology
Research Organization Incorporated

2 Kizukawadai-9-chome, Kizu-machi, Matsuyoshi-
ken, Kyoto-fu, Japan

Inventor: M. Hirano

c/o Yunichika K.K. Central Laboratories,
23 Ujikoza-kura, Uji-shi, Kyoto-fu, Japan

Inventor: K. Kadomoto

c/o Yunichika K.K. Central Laboratories,
23 Ujikoza-kura, Uji-shi, Kyoto-fu, Japan

Inventor: K. Yamata

c/o Yunichika K.K. Central Laboratories,
23 Ujikozaakura, Uji-shi, Kyoto-fu, Japan

Inventor: S. Murase

c/o Yunichika K.K. Central Laboratories,
23 Ujikozaakura, Uji-shi, Kyoto-fu, Japan

Title of the Invention: Biodegradable composite fibers

Abstract

Purpose:

To provide biodegradable composite fibers which can be can be manufactured with good thread forming properties and with which fibers which have different degrees of dyeability and biodegradability can be made.

Constitution:

Biodegradable composite fibers of an alternating arrangement type which are composite fibers constructed with component A and component B which have biodegradability and different crystallization rates, in which component A and component B are exposed at the fiber surface, being arranged alternately in the fiber cross section and both continuing in the fiber axis direction.

Scope of the Patent Claims

[Claim 1]

Alternating arrangement type biodegradable composite fiber, characterized in that it is a composite fiber constructed with component A and component B which have biodegradability and of which the crystallization rates are different, and component A and component B are exposed at the fiber surface arranged alternately in the fibre cross section and both continuing in the fibre axis direction.

[Claim 2]

Biodegradable composite fiber, according to claim 1, wherein component A is a copolymer of polybutylene succinate and polyethylene succinate, polybutylene adipate or polybutylene sebacate of molar ratio within the range from 100/0 to 90/10, and component B is copolymer of polybutylene succinate and polyethylene succinate, polybutylene adipate or polybutylene sebacate of molar ratio within the range from 85/15 to 65/35.

[Claim 3]

Biodegradable composite fiber, according to claim 1 or claim 2, wherein the total number of sequences of component A and component B is at least 12, and the composite ratio by weight of component A and component B is from 1/1 to 3/1.

Detailed Description of the Invention

[0001]

Industrial Field of Application

The invention concerns biodegradable composite fibers which can be made with good thread forming properties and with which fibers which have different degrees of dyeability and biodegradability can be made.

[0002]

Prior Art

Methods in which the spun filaments are cooled and solidified by blowing with a cold draught and then drawn have been adopted in the past for the manufacture of biodegradable fibers by the melt spinning method.

[0003]

However, polymers which have excellent biodegradability have crystallization temperatures below room temperature and, moreover, many have a low crystallization rate and it is impossible to achieve solidification by cooling by blowing with cold draught in the usual way among the spinning conditions, and so inadequate cooling and blocking have occurred.

[0004]

The cooling draught temperature has sometimes been lowered as a means of resolving this problem, the cooling time has sometimes been increased, and consideration has also been given to increasing the cooling draught velocity. However, it is still impossible to achieve adequate cooling with the methods in which the cooling

draught temperature is lowered, and limitations are imposed by the apparatus if the cooling time is increased, and with the methods where the cooling draught velocity is increased the fibers are caused to vibrate and there is a problem in that adjacent fibers stick together.

[0005]

Furthermore, various biodegradable fibers have been proposed, but fibers which have different degrees of dyeability and biodegradability corresponding to the application are required.

[0006]

Problems to be Resolved by the Invention

The present invention is intended to provide biodegradable composite fibers comprising biodegradable polymers of which the crystallization temperatures are low and which have different crystallization rate, which can be produced with good thread forming properties, and with which fibers which have different degrees of dyeability and biodegradability can be obtained.

[0007]

Means of Resolving these Problems

The present invention is intended to resolve the abovementioned problems, being in outline an alternating arrangement type biodegradable composite fiber, characterized in that it is a composite fiber constructed with component A and component B which have biodegradability and of which the crystallization rates

are different, and component A and component B are exposed at the fiber surface arranged alternately in the fibre cross section and both continuing in the fibre axis direction.

[0008]

The invention is described in detail below.

[0009]

A copolymer of polybutylene succinate (PBS) and polyethylene succinate (PES), polybutylene adipate (PBA) or polybutylene sebacate (PBSe) of molar ratio within the range from 100/0 to 90/10 is preferably used for component A.

[0010]

Furthermore, a copolymer of PBS and PES, PBA or PBSe of molar ratio within the range from 85/15 to 65/35, and preferably within the range from 85/15 to 70/30, is preferably used for component B.

[0011]

If the proportion of PBS in component A is below the abovementioned range then the thread forming properties are poor, and if the proportion of PBS in the component B is above the aforementioned range then the biodegradability and dyeability are poor while if it is below this range then the heat resistance and the thread performance of the fiber obtained are poor.

[0012]

These polymers are preferably of number average molecular weight at least 20,000, and preferably at least

30,000, in view of the thread forming properties and the properties of the fibers which are obtained.

[0013]

Inorganic crystallization nucleating agents, such as calcium carbonate, titanium dioxide, alumina, silica and talc for example, are preferably included in the polymers supplied for spinning in amounts of from 0.01 to 5 wt%, and preferably in amounts of from 0.05 to 2 wt%.

[0014]

The melt spinning temperature is according to the melting points and molecular weights of the polymers which are being used, but it is preferably from 150 to 280°C. Melt extrusion is difficult at spinning temperature below 150°C, and above 280°C there is pronounced degradation of the polymers and it is difficult to obtain high strength fibers.

[0015]

Component A and component B must be arranged alternately in the fiber cross section, both continue in the fiber axis direction, and be exposed at the fiber surface. With the biodegradable polymers, the polymers which have good crystallinity generally have a slow degradation rate and poor dyeability, while conversely the polymers which have a low crystallinity have excellent dyeability and biodegradability. When a polymer which has good crystallinity such as component A is used as a single type or as the sheath of a core-sheath type, all of the fiber surface is covered with

this material and so blocking is impeded, but the biodegradability and dyeability are poor. However, when a polymer which has low crystallinity such as component B is used, blocking occurs and the thread forming properties are poor. Thus, by exposing both components at the fiber surface it is possible to obtain fibers which have excellent film forming properties and excellent biodegradability and dyeability.

[0016]

The total number of sequences of component A and component B is preferably at least 12. If the number of sequences is small then the area of the fiber surface occupied by one sequence is considerable and adequate cooling performance, biodegradable performance and dyeability performance are not obtained. Furthermore, it is possible to make fibers in which these characteristics are different by varying the number of sequences.

[0017]

The composite ratio by weight of component A and component B is preferably from 1/1 to 3/1. If the amount of component A exceeds the aforementioned range then the biodegradability and dyeability are poor, and if it is low then blocking is liable to occur and the thread making properties are poor. Moreover, it is possible to make fibers which differ in respect of performance by changing the composite ratio.

[0018]

The melt spun threads are cooled by means of

ring-like or transverse blower which is established immediately following the spinning die. The cooled and solidified threads are pulled at a rate of from 300 to 3500 m/minute after the application of a spinning oil agent and drawn after winding up or without being wound up. The usual polyester fiber type spinning oil agents can be used for the spinning oil agent.

[0019]

The drawing is carried out at room temperature or using a hot roller, for example, in one step or in a number of steps. The drawing is preferably carried out in a number of steps to obtain high strength fibers, and the hot roller can be used at the time of the second stage drawing with a hot plate or a hot oven between the drawing rolls. In cases where dimensional stability is required in particular, the addition of a continuous fixed length heat treatment or relaxation heat treatment to the drawing process is desirable. It is possible to manufacture alternating arrangement type composite fibers which have fixed thread performance, biodegradability and dyeability which are durable in practice in this way.

[0020]

Illustrative Examples

The invention is described below in practical terms by means of illustrative examples. Moreover, the methods used for measurement and evaluation purposes are described below.

Tensile Strength and Elasticity

These were measured in accordance with JIS L 1013.

Biodegradability

The samples were buried in the ground for 3 months from July to October and then recovered and the strength was measured, and those where the fractional retention of strength was less than 50% were evaluated as being of class O and those where it was 50% or above were evaluated as being of class A.

Dyeability

Samples were dyed for 15 minutes at 70°C at a bath ratio of 1/100 using 1 % owf of Resolin Blue (a disperse dye manufactured by the Bayer Co.) and compared with a 100% PBS sample as a control, and those which were good were evaluated as class O and those where there was no real difference were evaluated as class A.

[0021] Example 1

Melt spinning was carried out using PBS of number average molecular weight 40,000 for component A and material obtained by adding 0.1 wt% of titanium dioxide to a copolymer of PBS and PES of molar ratio 80/20 for component B, supplying the materials to an extruder type melt spinning machine so as to produce from the spinning die threads with an arrangement number of 12 where component A and component B were radially arranged alternately in the fiber cross section at a spinning temperature of 170°C, and the threads were then cooled and solidified by transverse blowing and, after applying

a water base oiling agent emulsion, they were pulled at a rate of 400 m/minute and then subjected to first stage drawing at a drawing factor of 1.5 times and second stage drawing at a drawing factor of 2.7 times, the drawing being carried out to an overall drawing factor of about 4.1, and alternating arrangement type composite fibers of 315 d/36f were obtained.

[0022] Examples 2 to 4 and Comparative Examples 1 to 8

Threads were made in the same way as in Example 1 but under the conditions shown in Table 1. The properties of the composite fibers obtained in Examples 1 to 4 and Comparative Examples 1 to 8 are shown in Table 1.

[0023]

Table 1

KEY 1: Examples, 2: Comparative Examples, 3: Copolymer Composition (molar ratio), 4: Component A, 5: Component B, 6: Arrangement Number, 7: Composition Ratio by Weight, A/B, 8: Strength (g/d), 9: Elasticity (%), 10: Biodegradability, 11: Dyeability, 12: Control, 13: NOTE: Blocking occurred in Comparative Examples 2 to 5 and Comparative Examples 7 and 8.

	成分組成 (A/B)		例	成分組成 A/B	強度 (g/d)	弾性 (%)	生分解性	染色性
	成分 A	成分 B						
例	1	FEA/FEA = 10/0	FEA/FEA = 10/0	12	1/1	57	2.7	○ ○
	2	FEA/FEA = 10/0	FEA/FEA = 10/0	15	1/1	47	2.5	○ ○
	3	FEA/FEA = 10/0	FEA/FEA = 10/0	18	2/1	51	2.8	○ ○
	4	FEA/FEA = 10/0	FEA/FEA = 10/0	21	1/1	53	2.4	○ ○
比較例	1	FEA/FEA = 10/0	—	—	1/0	61	2.1	△ 20-4
	2	FEA/FEA = 10/0	—	—	1/0	—	—	—
	3	FEA/FEA = 10/0	—	—	1/0	—	—	—
	4	FEA/FEA = 10/0	FEA/FEA = 10/0	15	2/1	—	—	—
	5	FEA/FEA = 10/0	FEA/FEA = 10/0	18	1/1	—	—	—
	6	FEA/FEA = 10/0	FEA/FEA = 10/0	12	1/1	53	2.8	△ △
	7	FEA/FEA = 10/0	FEA/FEA = 10/0	1	1/1	—	—	—
	8	FEA/FEA = 10/0	FEA/FEA = 10/0	15	1/2	—	—	—

[0024]

注: 比較例 2~5 及び比較例 7~8 では、ブロッキングが発生した。

There was no blocking between filaments and composite fibers which had good properties were obtained in Examples 1 to 4, but blocking between filaments occurred in Comparative Examples 2 to 5 and Comparative Examples 7 and 8, and only fibers which had poor biodegradability and dyeability were obtained in Comparative Examples 1 and 6.

[0025]

Effect of the Invention

By means of this invention there are provided biodegradable composite fibers which can be produced with good fiber forming properties and which can be fibers which have different degrees of biodegradability and dyeability.